

James G. Pipe

REMARKS

Claims 1-20 are pending in the present application. In the Office Action mailed August 24, 2004, the Examiner rejected claims 1-20 under 35 U.S.C. §102(c) as being anticipated by Chapman (USP 6,697,507).

Chapman is directed to a ghost artifact reduction technique that analyzes sampled data to determine a correction without the acquisition of additional data. As shown in Figs. 2-3, Chapman teaches a linear k-space sampling scheme wherein parallel lines of k-space are filled with each echo. Specifically, "FIG. 2 illustrates the characteristic, alternate sweeping back and forth, sampling of k-space trajectory of the standard blipped EPI sequence." Col. 6, lns. 39-41. "FIGS. 3 (a and b) show EPI sample points displaced relative to the true phase encode axis which passes through the center of k-space where all spins align." *Id.*, lns. 42-44.

Chapman, in the text corresponding to the description of Fig. 2, teaches that "[b]y employing phase encoding increments during rapid switching of the read encoding, the sampling sweeps back and forth across k-space, as shown in FIG. 2." Col. 7, lns. 37-39. Chapman further teaches that "the signal evolution proceeds in an opposite sense in time in alternate k-space lines, resulting in alternate lines in the sampled data being time reversed." *Id.*, lns. 19-24. Chapman terms the forward lines as odd lines of k-space and the reverse lines as even lines of k-space. See *id.* at lns. 24-26. In short, "the sampled data is first split into odd and even data sets for each segment." Col. 12, lns. 43-45.

In contrast, the claimed invention, as defined by claim 1, is directed to diffusion weighted MR imaging whereby MR data acquisition is split into non-parallel odd and even echo acquisition blades for each echo train. For each echo train, the odd and even acquisition blades are rotated about an origin point with respect to a previous acquisition. The data collected from each odd and even data acquisition blades is then combined into a composite set of MR data for reconstruction.

One skilled in the art will readily appreciate that there are a number of distinctions between that claimed and that taught by Chapman. For example, claim 1 calls for non-parallel odd and even echo acquisition blades. As shown in Figs. 2-3 and 10-11, Chapman teaches odd and even acquisition segments. Specifically, Chapman explicitly teaches odd lines of k-space that are parallel to even lines of k-space. That is, Chapman teaches the acquisition of forward (odd) lines followed by the acquisition in a reverse order of reverse (even) lines. Chapman neither teaches nor suggests that the odd lines of k-space are anything but parallel to the even lines of k-space.

James G. Pipe

S/N: 10/604,597

Additionally, the present invention claims the rotation of the odd and even acquisition blades about an origin point with respect to a previous acquisition whereby each blade extends through an origin point. Applicant does not disagree that Chapman teaches a forward-reverse acquisition, but such an acquisition is not equivalent to a rotation about an origin of k-space. More particularly, Chapman teaches a linear filling of k-space whereby k-space lines are filled sequentially; not centered about a central point or origin or arranged in such a manner that each blade extends through the center of k-space.

Accordingly, Applicant respectfully believes that Chapman fails to teach or suggest a method of diffusion weighted MR imaging that includes the steps of, for each echo train, splitting MR data acquisition into non-parallel odd and even echo acquisition blades, for each echo train, rotating the odd and even acquisition blades of data acquisition about an origin point with respect to a previous acquisition, and combining data collected from each odd and even data acquisition blades into a composite set of MR data for reconstruction.

Applicant likewise believes that Chapman fails to teach or suggest an MRI apparatus having a magnetic resonance imaging (MRI) system having a plurality of gradient coils positioned about a bore of a magnet to impress a polarizing magnetic field and an RF transceiver system and an RF switch controlled by a pulse module to transmit RF signals to an RF coil assembly to acquire MR images, and a computer programmed to segment acquisition of each echo train into an odd section and an even section, wherein each odd and even section extends through an origin point, acquire a segment of MR data, rotate each segmented acquisition a prescribed interval about the origin point for each subsequent acquisition, combine MR data from corresponding odd and even sections into a composite set of MR data, and reconstruct an image from the composite set.

Similarly, Chapman fails to teach or suggest a computer readable storage medium having stored thereon a computer program comprising instructions which when executed by a computer cause the computer to, for each echo train, segment data acquisition into an odd data acquisition and even data acquisition, associate a strip of k-space extending through a center of k-space for each data acquisition, rotate the strip of k-space for the odd data acquisition and the even data acquisition for each subsequent echo train, and combine parallel strips of data collected for each odd and even acquisition into a composite set of MR data for image reconstruction.

Therefore, in light of at least the foregoing, Applicant respectfully believes that the present application is in condition for allowance. As a result, Applicant respectfully requests timely issuance of a Notice of Allowance for claims 1-20.

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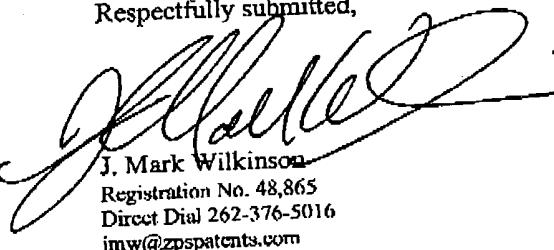
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S/N: 10/604,597

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Applicant appreciates the Examiner's consideration of these Remarks and cordially invites the Examiner to call the undersigned, should the Examiner consider any matters unresolved.

Respectfully submitted,



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